Heating Controller

Features

- Dual Voltage (120/240V) operations
- Internal 5V Zener
- Auto temperature control with NTC
- NTC open protection
- Multi mode LED indicator
- Pulse trigger for high current SCR/TRIAC
- Auto Heating off after heating timer timeout (1.2h at 50Hz and 1h at 60)
- Low cost 8-Pin DIP/SOIC package

Description

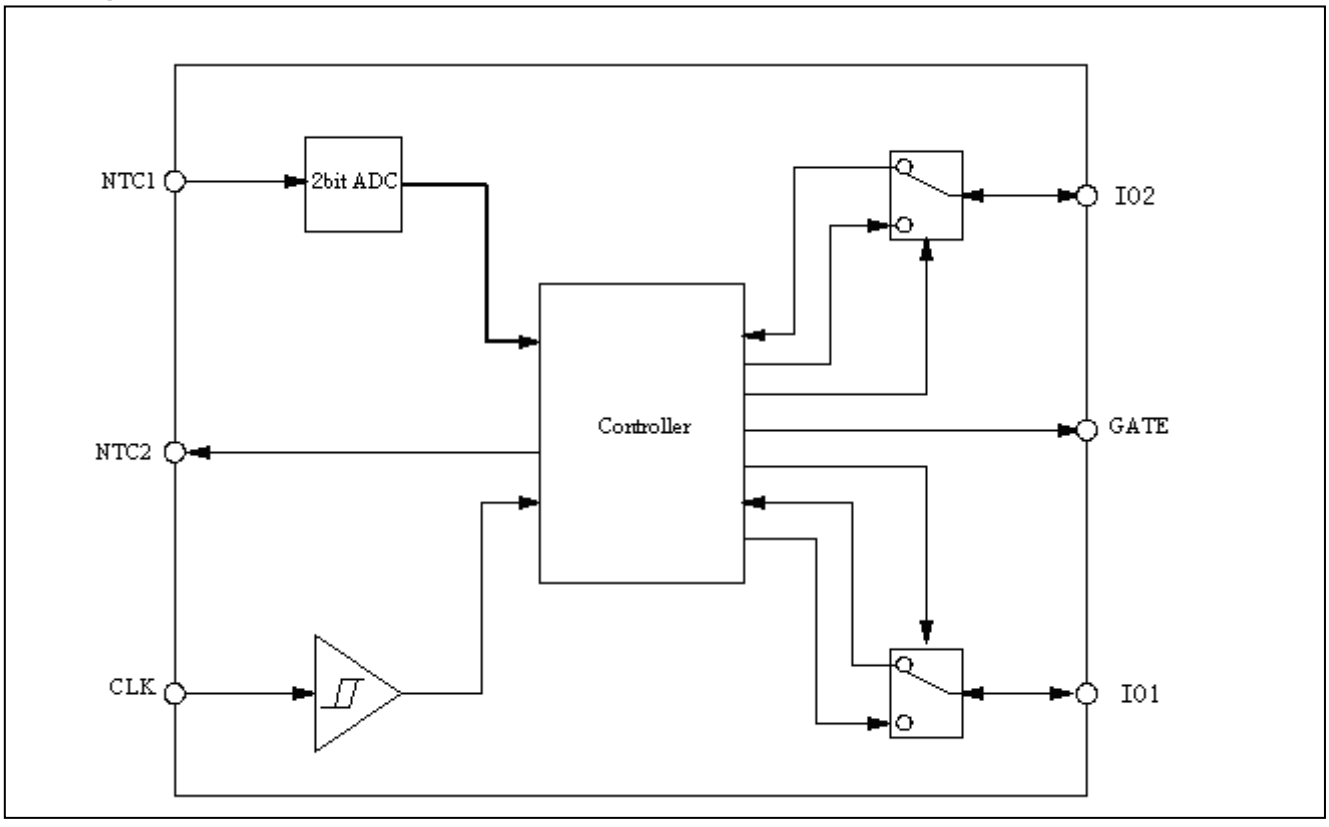
The PT8A3299/3289 is a mixed signal CMOS LSI chip designed as heating controller with help of external NTC (Negative Temperature Component). NTC open protection is implemented for device safety.

- Auto heating-off after heating timer timeout.
- Auto temperature control: maintains user selected temperature.
- 120V/240V Dual-voltage.

Applications

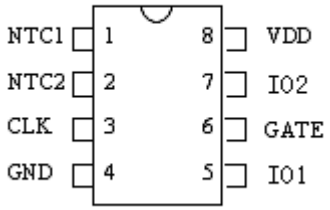
- Curler
- Straightener

Block Diagram



Pin Assignment

PT8A3289x/3299x



Pin Description

Pin Name	Pin No.	I/O	Description
NTC1	1	I	NTC voltage input, NTC open detection input
NTC2	2	O	Output signal for NTC open detection
CLK	3	I	Clock input from power line
IO1	5	I/O	**3289(3299)A/B/C/D/M/N/O/P:** Heating-on button input. and LED1 driving output **3289(3299)E/F/G/H/Q/R/S/T:** Heating-on/off button input and LED1 driving output **3289(3299)I/J/K//L/U/V/W/X:** Only LED1 driving output
GATE	6	O	SCR/TRIAC trigger output
IO2	7	I/O	**3289(3299)A/B/C/D/M/N/O/P:** Heating-off button input and LED2 driving output **3289(3299)E/F/G/H/Q/R/S/T:** Only LED1 driving output **3289(3299)I/J/K//L/U/V/W/X:** Only LED1 driving output
GND	4	Ground	Ground
VDD	8	Power	Power

Maximum Ratings

Storage Temperature	-65°C to +150°C
Supply Voltage to Ground Potential (Input & V_{CC} Only)	-0.5V to + 5.5V
Supply Voltage to Ground Potential (Outputs Only)	-0.5V to + 5.5V
DC Input Voltage	-0.5V to + 5.5V
DC Output Current	20mA
Power Dissipation	500mW

Note:
Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommended operation conditions

Symbol	Parameter	Min	Typ	Max	Unit
CLK	Input CLK Frequency	-	50/60	-	V
T_A	Operating temperature	-20	25	85	℃

AC Electrical Characteristics

(V_{DD} = 4.0~5.5V, T_A = -20 ~ 85 ℃, unless otherwise noted)

Symbol	Description	Test Conditions	Min	Type	Max	Unit
F_{CLK}	Frequency of CLK	-	-	50/60	-	Hz
T_{GATE}	Width of trigger pulse	-	240	300	360	μS
Timer	Power off timer	50Hz	-	72	-	Minute
		60Hz	-	60	-	

DC Electrical Characteristics

DC characteristics (V_{DD} = 4.0 ~ Vz, T_A = -20 ~ 85℃, unless otherwise noted)

Symbol	Description	Test Conditions		Min	Type	Max	Unit
I_{IH}	Input high current	PIN: CLK	$V_{IN} = V_{DD}$	-	-	1	μA
		PIN: NTC1	$V_{IN} = V_{DD}$	-	-	1	μA
		PIN: NTC2	$V_{IN} = V_{DD}$,Output High impedance	-	-	1	μA
I_{IL}	Input low current	PIN: CLK	V_{IN} = GND	-	-	-1	μA
		PIN: NTC1	V_{IN} = GND	-	-	-1	μA
		PIN: NTC2	V_{IN} = GND, Output High impedance	-	-	-1	μA
I_{OH}	Output High current	PIN: GATE	V_{DD} =Vz Vout = 2.5V	-20	-	-	mA
		PIN:IO1	V_{DD} =Vz Vout = 1.9V	-0.7	-1.0	-1.3	mA
		PIN:IO2	V_{DD} = Vz Vout = Vz-1.9V	-50	-	-200	μA
I_{OL}	Output Low current	PIN: NTC2	V_{DD} = Vz Vout =0.5V	5.0	-	-	mA
		PIN: GATE	V_{DD} =Vz Vout =0.5V	5.0	-	-	mA
		PIN: IO2	V_{DD} = Vz Vout =Vz-1.9V	0.7	1.0	1.3	mA
		PIN: IO1	V_{DD} = Vz Vout = 1.9V	50	-	200	μA
V_{NTCO}	Input NTC open Voltage of NTC1 Pin	-		1.1	1.28	1.4	V
V_{NTC1}	Input Voltage1 of NTC1 Pin	V_{DD} = 4.5V		1.65	1.69	1.73	V
V_{NTC2}	Input Voltage2 of NTC1 Pin	V_{DD} = 4.5V		2.11	2.15	2.19	V
V_{NTC3}	Input Voltage3 of NTC1 Pin	V_{DD} = 4.5V		2.21	2.25	2.29	V
VT_1	Input Threshold Voltage of Pin 5	V_{DD} =4.5V		0.5	-	1.5	V
VT_2	Input Threshold Voltage of Pin 7	V_{DD} =4.5V		3.4	-	4.0	V
V_{LEVEL}	Input Threshold Voltage of CLK Pin for power level detection	V_{DD} = 4.5V		1.7	1.88	2.1	V
VT_{CLK}	Input Threshold Voltage of CLK Pin in CLK rise edge	VTL_CLK1	V_{LEVEL} is high	-180	-226	-275	mV
		VTH_ CLK1		-100	-150	-200	
		VTL_ CLK1	V_{LEVEL} is low	-135	-168	-201	
		VTH_ CLK1		-40	-90	-140	
	Input Threshold Voltage of CLK Pin in CLK fall edge	VTL_CLK2	V_{LEVEL} is high	105	145	185	
		VTH_CLK2		194	242	290	
		VTL_CLK2	V_{LEVEL} is low	70	90	110	
		VTH_CLK2		136	170	204	
V_{POR}	Voltage of POR	-		2.7	-	3.5	V
V_Z	Voltage of Zener	I_{DD}= 500uA ~ 10mA		4.5	5.0	5.5	V
I_{DD}	Current consumption	NTC1,CLK pin tied to ground V_{DD} =4.5V		-	-	500	μA

Functional Description

- **State description**

◆ Reset
The device will be in reset state after power-on.

◆ Heating on
The device will be in heating-on state after heating-on button is on for two-key parts
The device will be in heating-on state after power on for no-key parts
For one-key parts the ON/OFF button will toggle heating on and heating off, the first time is heating on.

◆ Heating off
This device enters heating-off state after power-on reset enabled or heating timer timeout.

- **NTC open protection**
When NTC is open, NTC1 pin will be pulled low in the NTC open detection period.

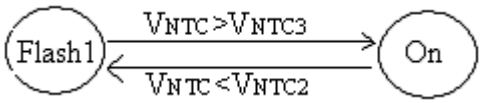
- **Timer**
If the timer enables, the IC will be auto heating-off after working 1 hour for 60Hz power or 1.2 hour for 50Hz power.

- **Control signal output**

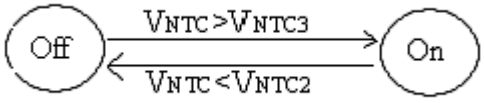
When working in Heating-on state, Gate/LED output will be related to NTC1 input and CLK input amplitude.
Effect of NTC and VT_{CLK}(Level 2) on GATE and LED indication

Working State	NTC (NTC open detection)	NTC (Normal temp detection)	LED			
			Flash		No flash	
			LED1	LED2	LED1	LED2
ON	V_{NTCO}~ V_{DD}	0~ V_{NTC2}	Flash1*	Invert LED1	On	Off
		V_{NTC2} ~V_{NTC3}	State1*	Invert LED1	On	State2*
		V_{NTC3}~ V_{DD}	On	Off	On	On
Off		X	Off	On	Off	Off
X	0~V_{NTCO}	X	Flash2*	Invert LED1	Flash2	Invert LED1

*Note: 1) X means any input.
2) Flash1 frequency is 1/32 clock.
3) Flash2 frequency is 1/8 clock
4) State1 is as below: LED1 will be from Flash1 state to on state when V_{NTC} rises above V_{NTC3}.
LED1 will be from on state to Flash1 state when V_{NTC} drops below V_{NTC2}.



5) State2 is as below: LED2 will be from off state to on state when V_{NTC} rises above V_{NTC3}.
LED2 will be from on state to off state when V_{NTC} drops below V_{NTC2}.



PT3299x for dual-voltage

Working State	NTC (NTC open detection)	NTC (Normal temp detection)	GATE Duty Cycle (trigger to SCR/TRIAC)			
			75% turn to half-power		100% turn to half power	
			120V	240V	120V	240V
ON	V_{NTCO}~ V_{DD}	0 ~ V_{NTC1}	100%	25%	100%	25%
		V_{NTC1} ~ V_{NTC3}	50%	12.5%	100%	25%
		V_{NTC3}~ V_{DD}	0	0	0	0
Off		X	0	0	0	0
X	0~V_{NTCO}	X	0	0	0	0

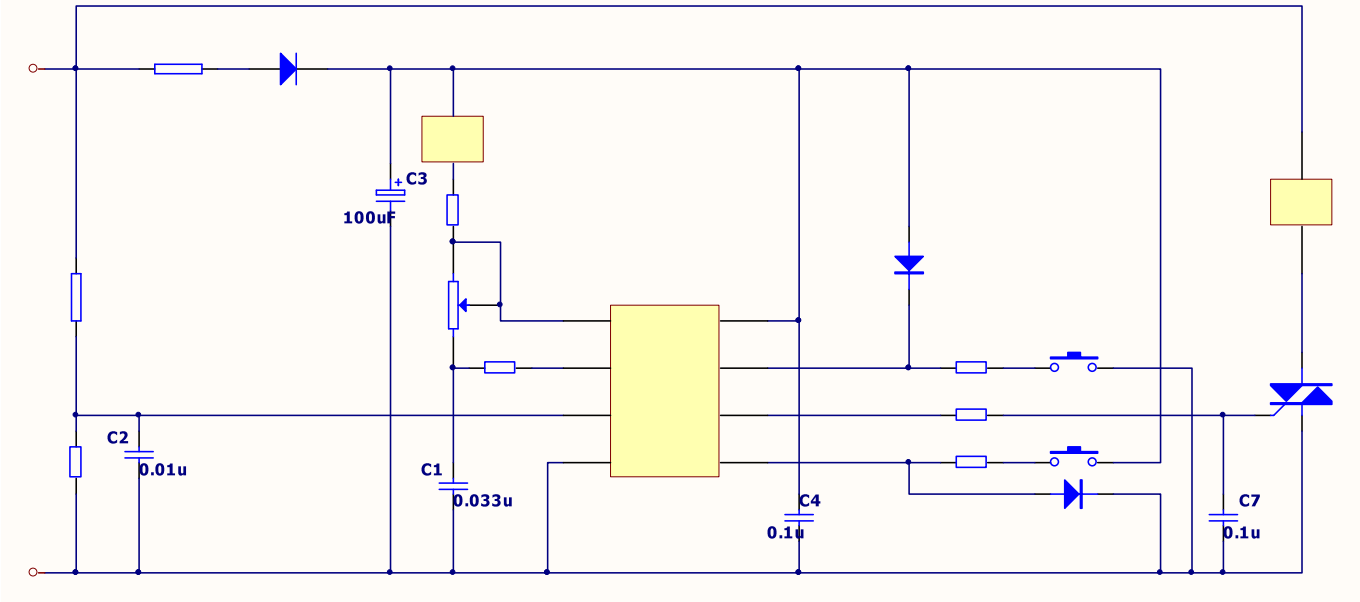
Note: 1) In 120V operation, one-time drive could not be shorter than 1S, 50% power is 1S on and 1S off.
2) In 240V operation, output is 1/4 duty of 120V.

PT3289x for full-voltage

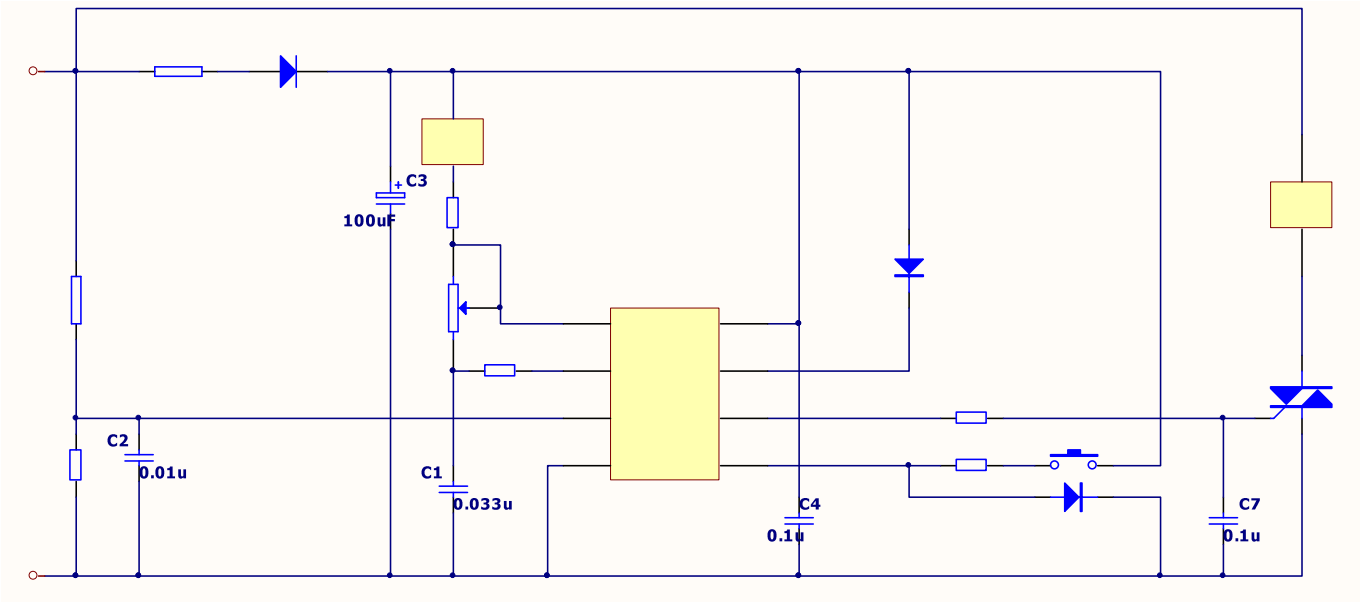
Working State	NTC (NTC open detection)	NTC (Normal temp detection)	GATE Duty Cycle (trigger to SCR/TRIAC)			
			75% turn to half-power		100% turn to half power	
			120V	240V	120V	240V
ON	V_{NTCO}~ V_{DD}	0 ~ V_{NTC1}	100%	100%	100%	100%
		V_{NTC1} ~ V_{NTC3}	50%	50%	100%	100%
		V_{NTC3}~ V_{DD}	0	0	0	0
Off		X	0	0	0	0
X	0~V_{NTCO}	X	0	0	0	0

Application Circuit

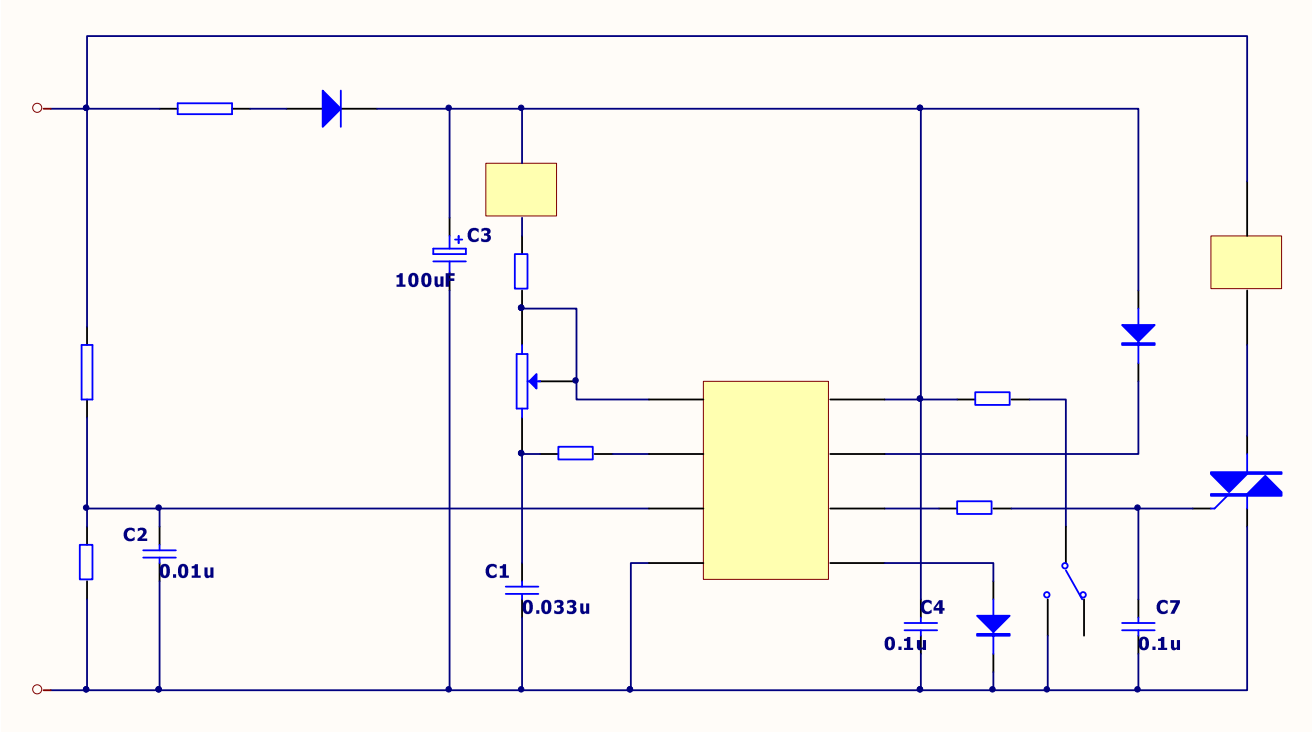
1. **PT8A3289A/B/C/D/M/N/O/P; PT8A3299A/B/C/D/M/N/O/P for TRIAC**



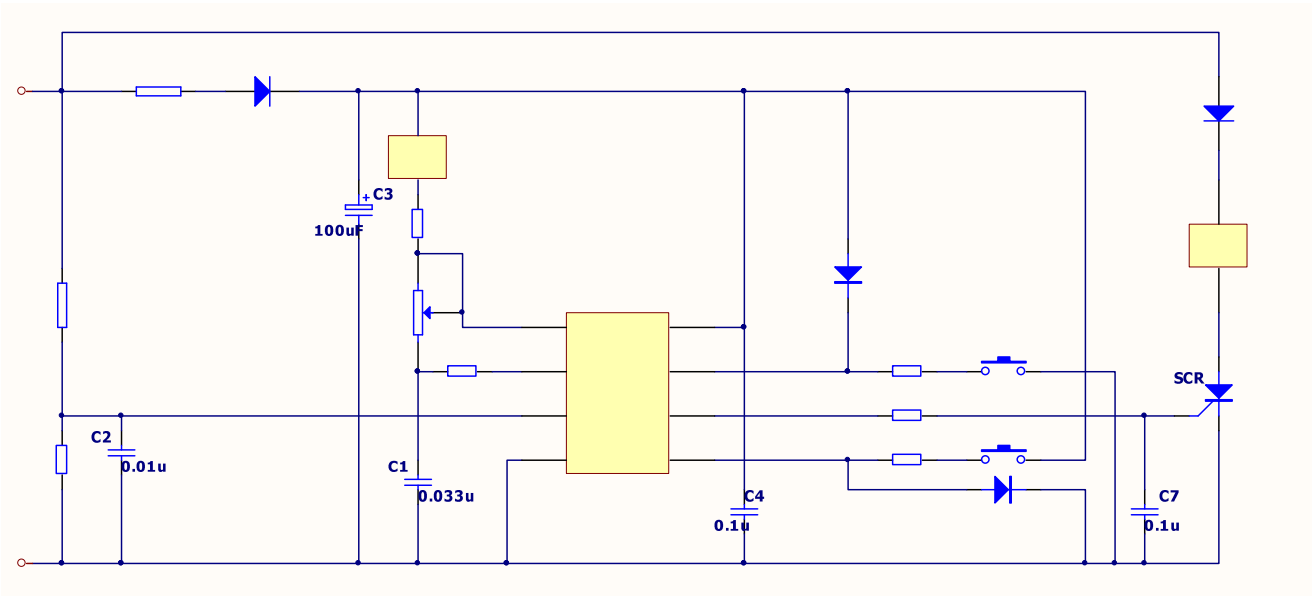
2. **PT8A3289E/F/G/H/Q/R/S/T; PT8A3299E/F/G/H/Q/R/S/T for TRIAC**



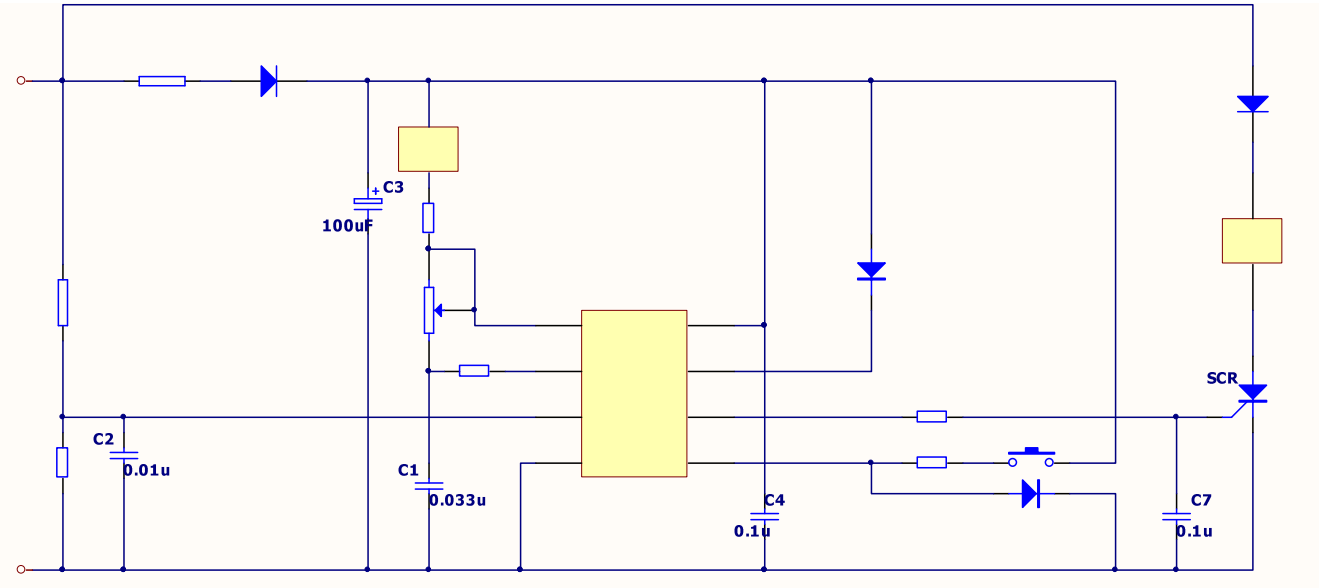
3. PT8A3289I/J/K/L/U/V/W/X; PT8A3299I/J/K/L/U/V/W/X for TRIAC



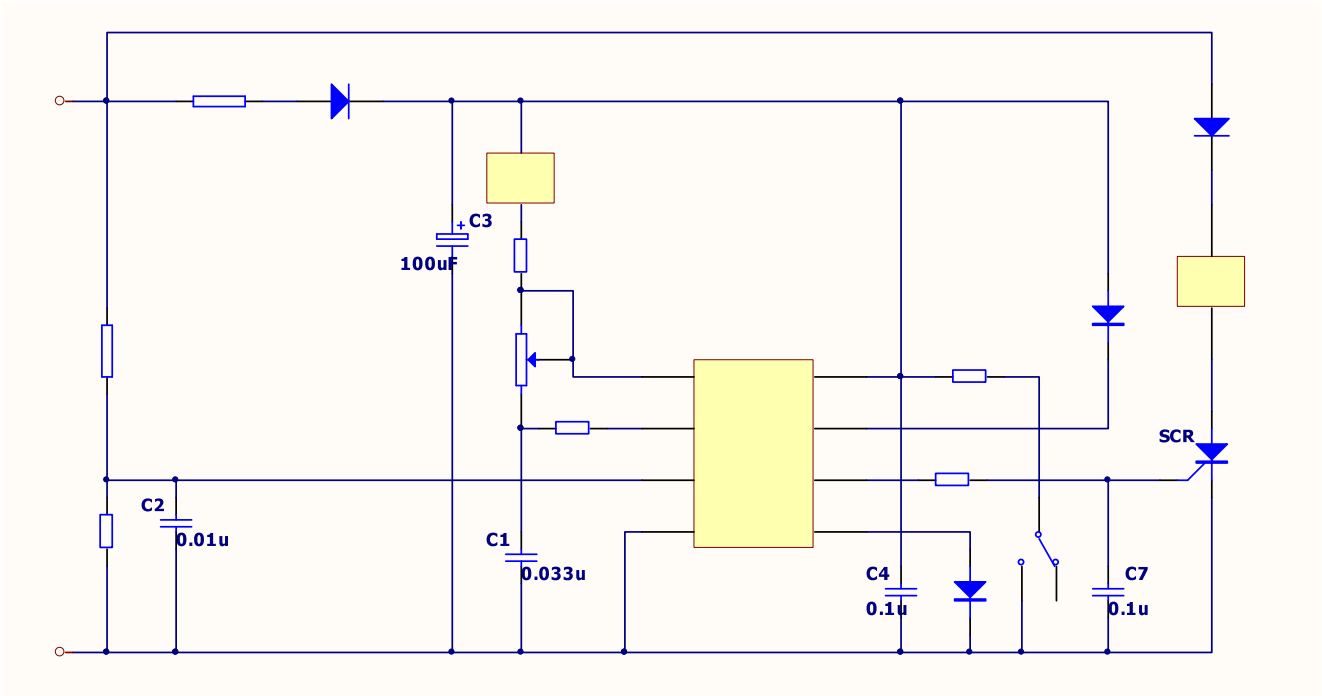
4. PT8A3289A/B/C/D/M/N/O/P; PT8A3299A/B/C/D/M/N/O/P for SCR



5. PT8A3289E/F/G/H/Q/R/S/T; PT8A3299E/F/G/H/Q/R/S/T for SCR

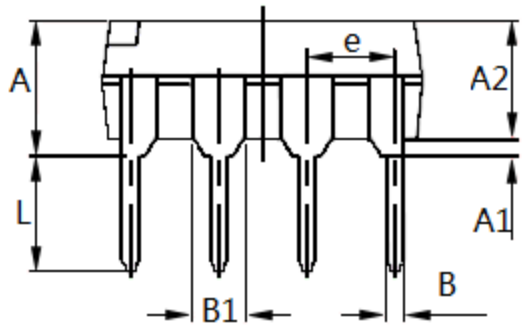


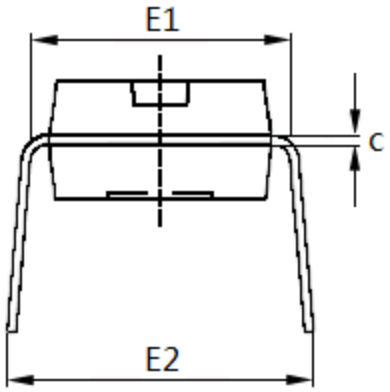
6. PT8A3289I/J/K/L/U/V/W/X; PT8A3299I/J/K/L/U/V/W/X for SCR

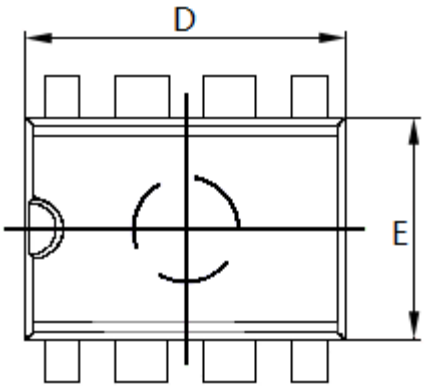


Mechanical Information

PE (DIP-8)



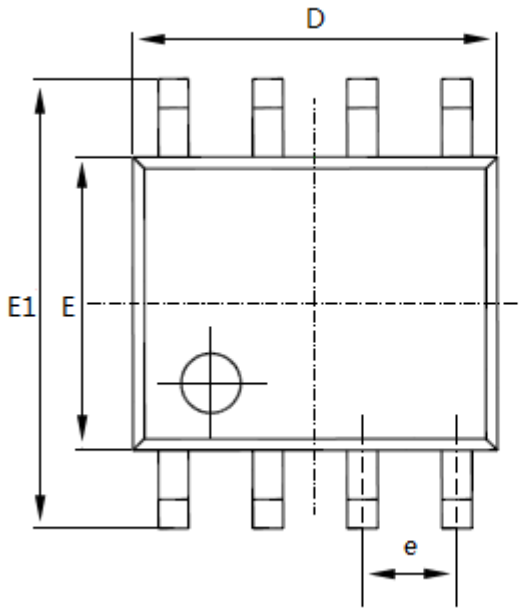


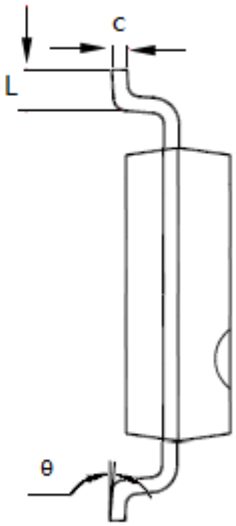


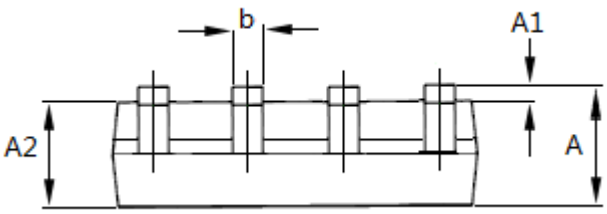
Symbol	ions In Millimeters	
	Min	Max
A	3.710	4.310
A1	0.510	
A2	3.200	3.600
B	0.380	0.570
B1	1.524 BSC	
c	0.204	0.360
D	9.000	9.400
E	6.200	6.600
E1	7.320	7.920
e	2.540 BSC	
L	3.000	3.600
E2	8.400	9.000

Note:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC MS-001D/BA

WE (SOIC-8)







Note:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC MS-012E/AA

Symbol	Dimensions In Millimeters	
	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	4.700	5.100
E	3.800	4.000
E1	5.800	6.200
e	1.27 BSC	
L	0.400	1.270
θ	0 °	8 °

Ordering Information

Part No.	Package Code	Package
PT8A3289xPE	P	Lead free 8-Pin DIP
PT8A3289xWE	W	Lead free and Green 8-Pin SOIC
PT8A3299xPE	P	Lead free 8-Pin DIP
PT8A3299xWE	W	Lead free and Green 8-Pin SOIC

Note:
- "x" shows A~X with different function. See *Function Comparison Table*.
- E = Pb-free and Green
- Adding X Suffix= Tape/Reel
- *Contact Pericom for availability.

Function Comparison Table

PT8A3289x for full-voltage

Part number	LED Flash	Timer	Switch	Trip point turn to half-power
PT8A3289A*	Y	Y	Two-key	75%
PT8A3289B*	Y	N		
PT8A3289C*	N	Y		
PT8A3289D*	N	N		
PT8A3289E*	Y	Y	One-key	
PT8A3289F*	Y	N		
PT8A3289G*	N	Y		
PT8A3289H*	N	N		
PT8A3289I*	Y	Y	No-key	
PT8A3289J*	Y	N		
PT8A3289K*	N	Y		
PT8A3289L*	N	N		
PT8A3289M*	Y	Y	Two-key	100%
PT8A3289N*	Y	N		
PT8A3289O*	N	Y		
PT8A3289P*	N	N		
PT8A3289Q	Y	Y	One-key	
PT8A3289R*	Y	N		
PT8A3289S*	N	Y		
PT8A3289T	N	N		
PT8A3289U*	Y	Y	No-key	
PT8A3289V*	Y	N		
PT8A3289W*	N	Y		
PT8A3289X*	N	N		

Note: *Contact Pericom for availability.

PT8A3299x for dual-voltage

Part number	LED Flash	Timer	Switch	Trip point turn to half-power
PT8A3299A*	Y	Y	Two-key	75%
PT8A3299B*	Y	N		
PT8A3299C*	N	Y		
PT8A3299D*	N	N		
PT8A3299E*	Y	Y	One-key	
PT8A3299F*	Y	N		
PT8A3299G*	N	Y		
PT8A3299H*	N	N		
PT8A3299I*	Y	Y	No-key	
PT8A3299J*	Y	N		
PT8A3299K*	N	Y		
PT8A3299L*	N	N		
PT8A3299M*	Y	Y	Two-key	100%
PT8A3299N*	Y	N		
PT8A3299O*	N	Y		
PT8A3299P*	N	N		
PT8A3299Q*	Y	Y	One-key	
PT8A3299R*	Y	N		
PT8A3299S*	N	Y		
PT8A3299T*	N	N		
PT8A3299U*	Y	Y	No-key	
PT8A3299V*	Y	N		
PT8A3299W*	N	Y		
PT8A3299X*	N	N		

Note: *Contact Pericom for availability.